ChemEcol Ashless Diesel Combustion Enhancer Additive

Presented to:

AIR RESOURCES BOARD

The Mobile Source, Fuels, and Alternative Strategies Subcommittees

Friday, February 18, 2000

Sacramento, California, USA

by: *Dr. S. Omar Hayat*

ChemEcol Netherlands BV
Bergsingel 271
3037 GW, Rotterdam
The Netherlands

Tel: *+31 10 265 4887*
Fax: *+31 10 265 4886*

Website: *http://www.chemecol.net*

Email: *chemecolbv@chemecol.net*

ChemEcol Technology & Product Performance

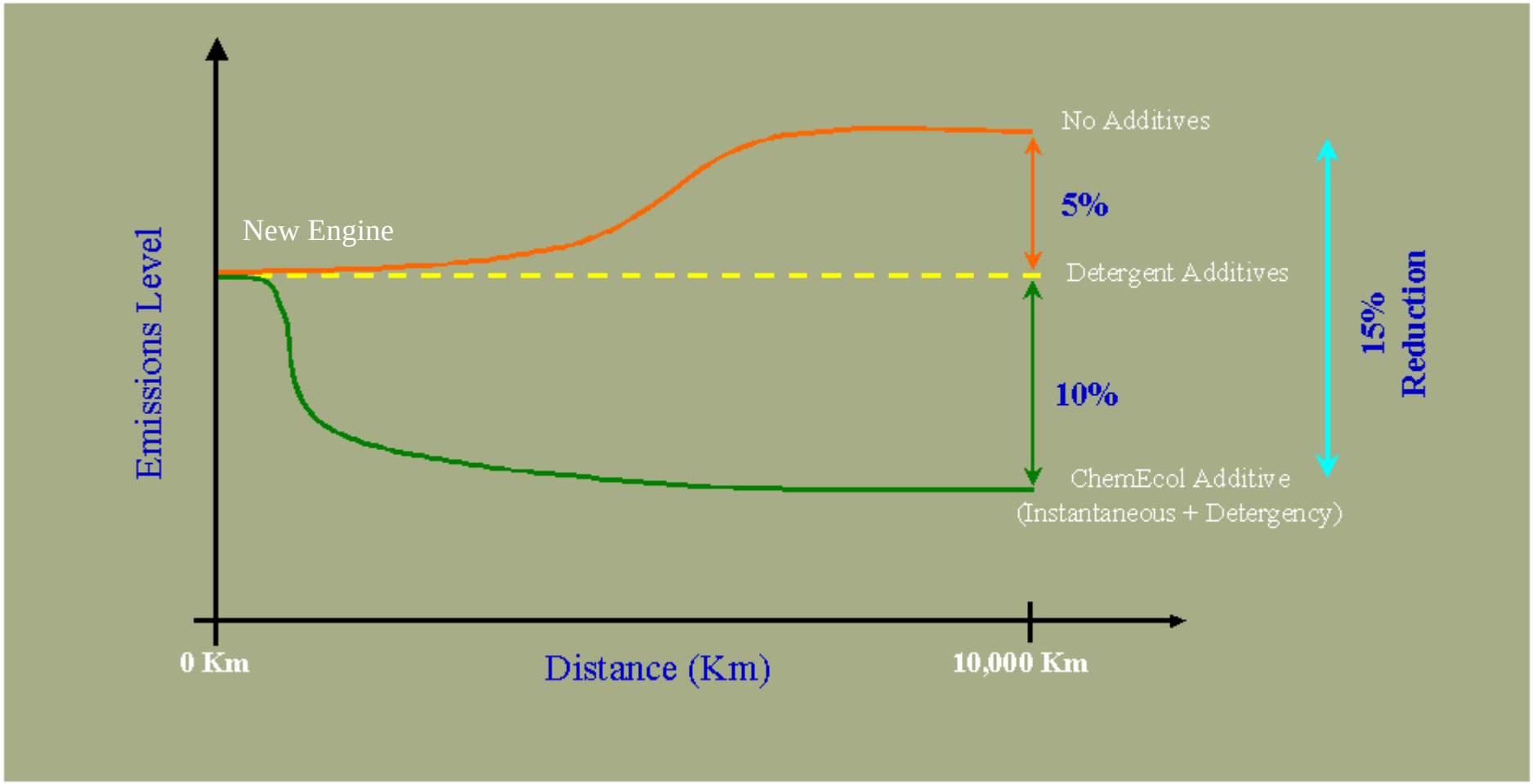
What is it ?

An Ashless combustion Enhancer based on Hydrocarbon Chemistry - patented

How it Works

Effective manipulation of the competitive kinetic reactions occurring in the primary and true combustion zones to reduce un-burnt hydrocarbon and particulate emissions. Associated detergency of the additive ensures maintenance of the lower emissions.

Effect of Additive Technologies on Emission from New Vehicles with Mileage



Effect of ChemEcol Ashless Additive Technology on Regulated Emissions

Light Duty Tests

Engine	Fuel	European Cycle	Test Sequence	Pm % Reduction	NOx % Reduction	CO % Reduction	HC % Reduction
Peugeot 205	Pre EN590	ECE15+EUDC	B, B, B, CXI, CXI, CXI, B, B, B	11	- 8	- 1	-4
Vauxhall Astra	Pre EN590	ECE15+EUDC	B, B, B, CXI, CXI, CXI	19	1.5	2.3	14.5
MB220 D	EN590	MVEG	B, CXII, CXII, CXII, B	10	4	38	28
Fiat Ducato 2.5D	EN590	MVEG	B, B, CXII, CXII, B, B	13	1.2	-	14

CX1 - 1st Generation Additive
CXII - 2nd Generation Additive
CXIII - 3rd Generation Additive

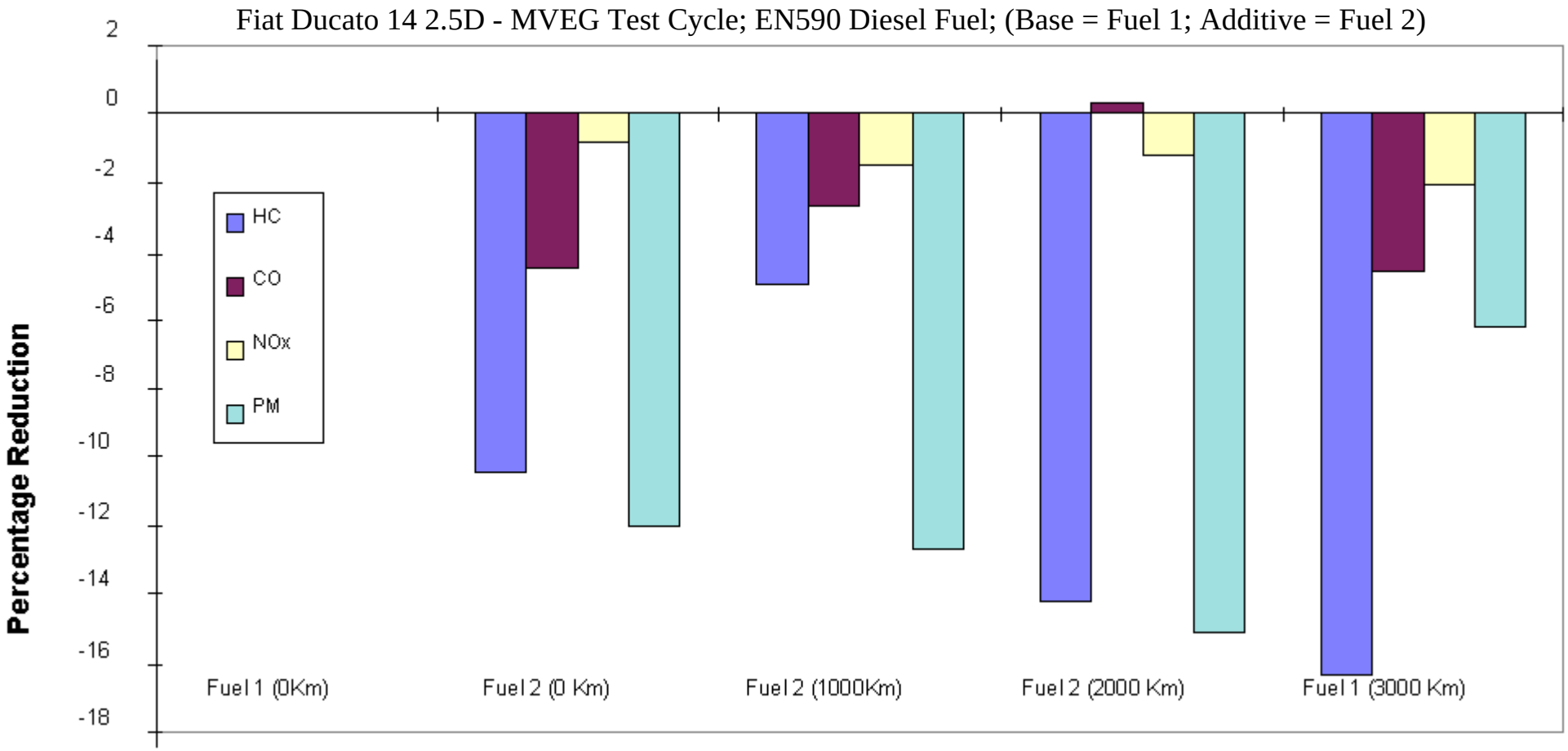
Heavy Duty Tests

Engine	Fuel	European Cycle	Test Sequence	Pm % Reduction	NOx % Reduction	CO % Reduction	HC % Reduction
OM364A	RF90	R49	B, B, CXI, CXI, CXI	13	-4.0	5.3	5.6
IVECO 8360	EN590	R49	B, B, CXII, CXII, B, B, B	15	1.2	0	14.2
OM602	EN590	R49	B, CXII, CXII, B	17	11.5	48*	60*

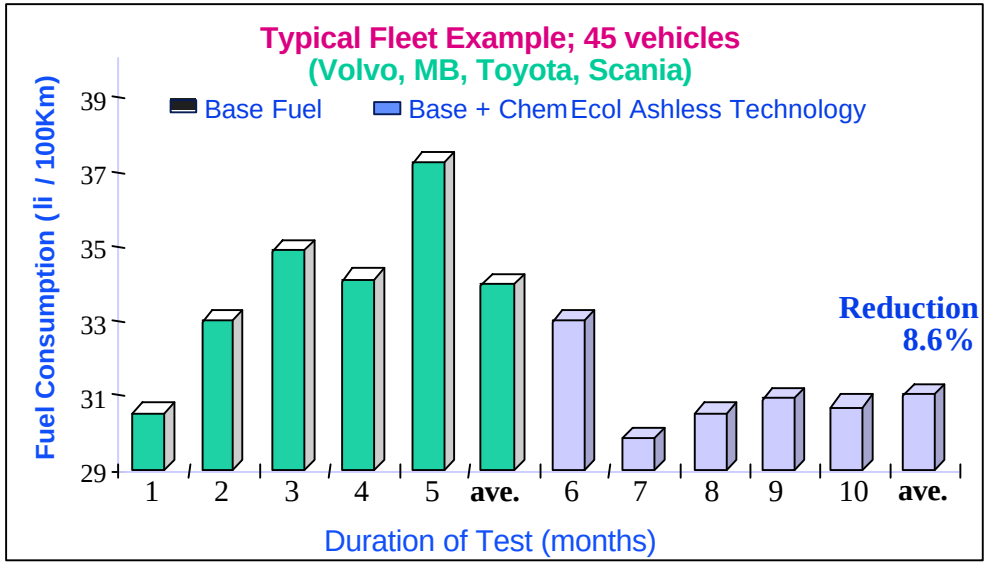
*low absolute values (0.9 and 0.05 g/kwh respectively for base fuel)
-ve sign denotes increase

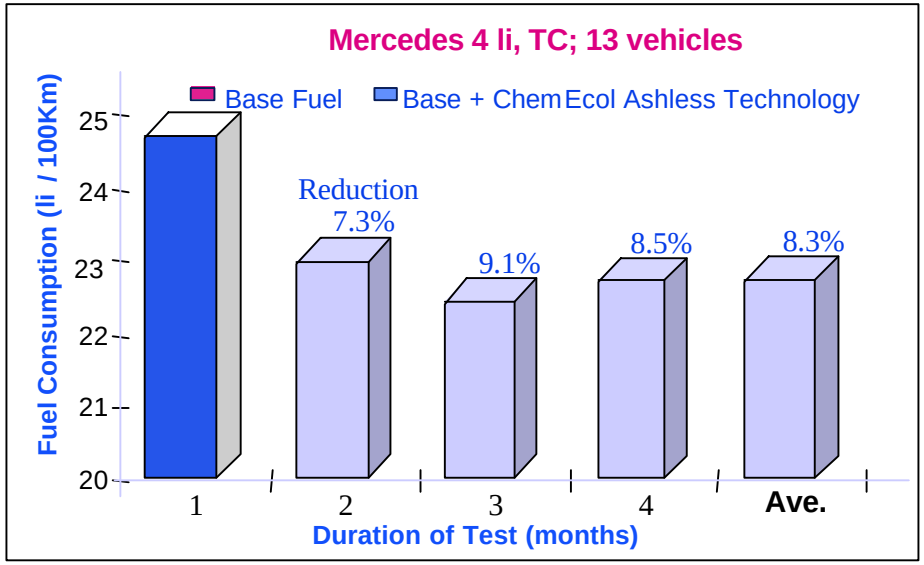
ChemEcol

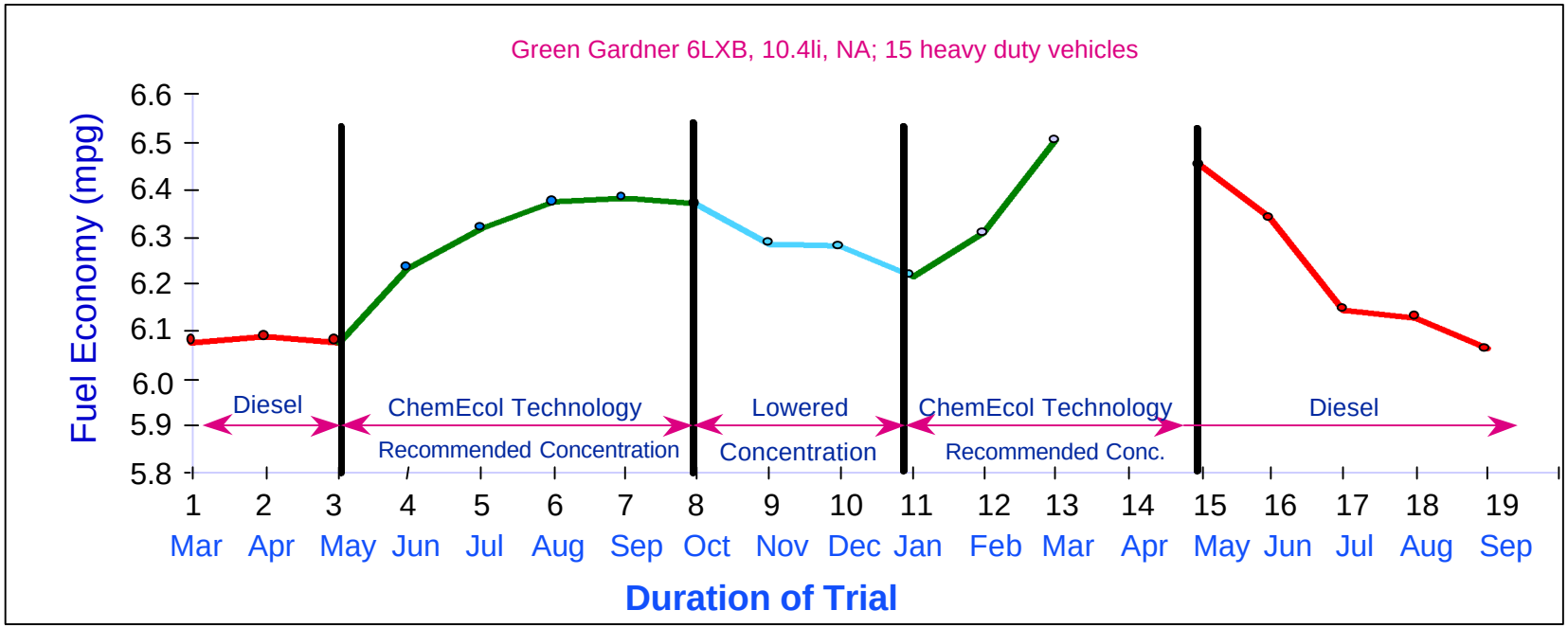
Test on ChemEcol Ashless Combustion Enhancer Additive Showing Instantaneous and Duration Effects on Emissions



Effect of ChemEcol Ashless Additive Technology on Fuel Consumption







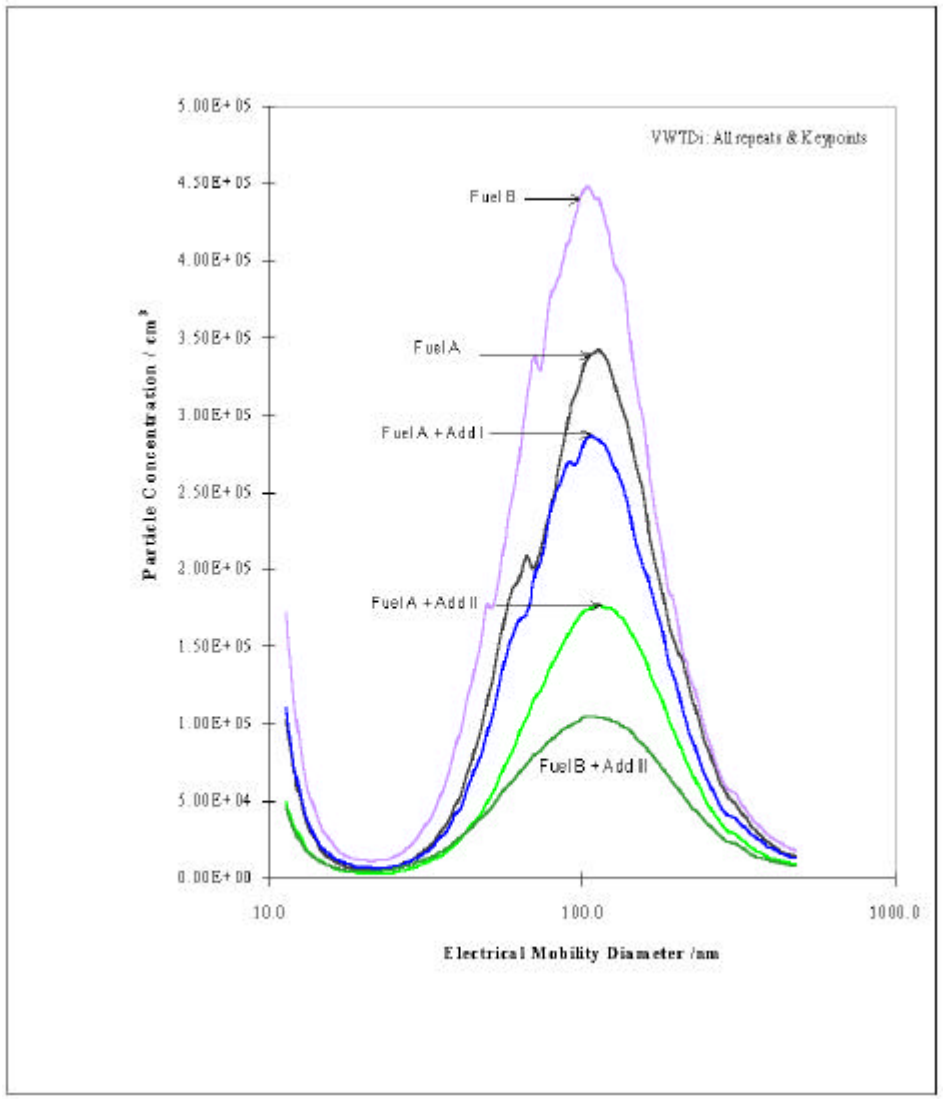
Effect of ChemEcol Ashless Additive Technology on Emissions of Ultra Fine Particles

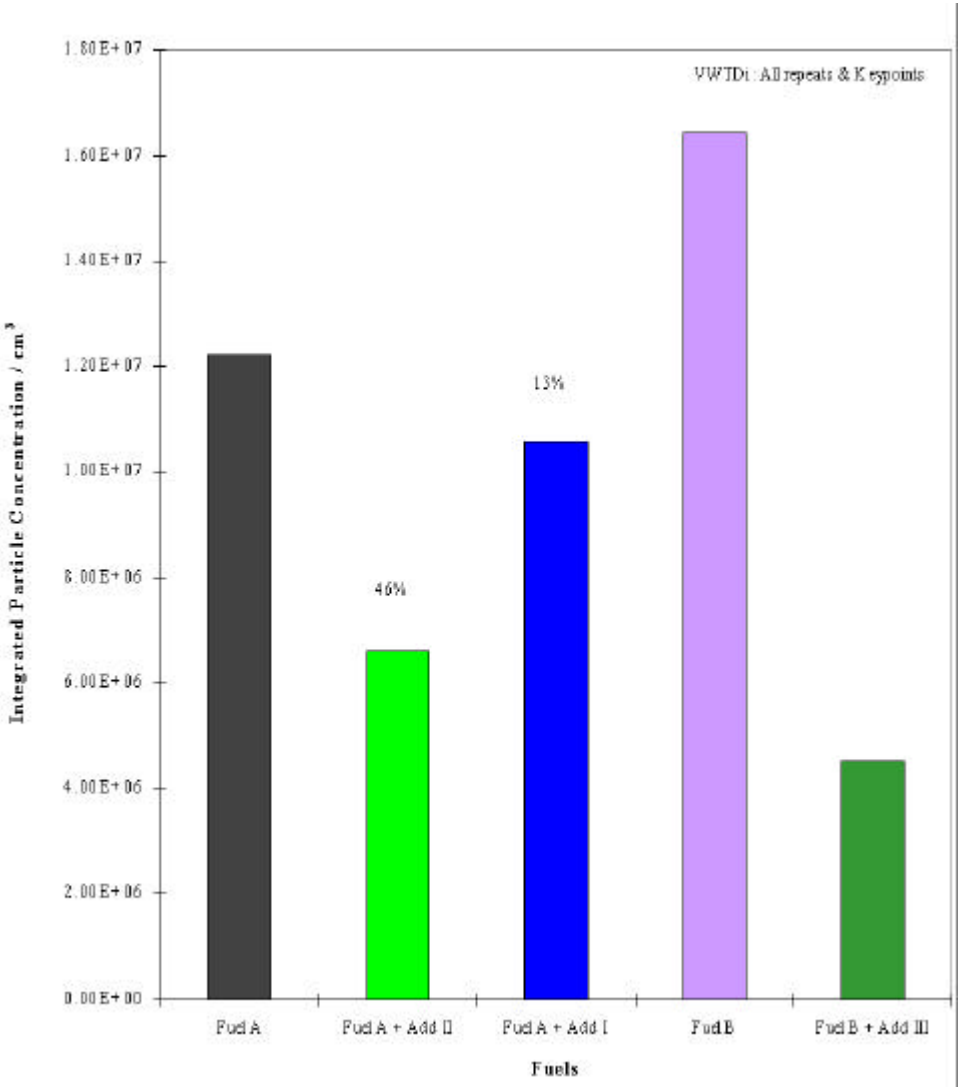
Results are presented on a purely comparative basis with effects illustrated as graphical differences. Data are presented in terms of number concentration vs. electrical mobility diameter on a logarithmic scale for the SMPS. These data reflect the effect of the additive in physical terms, on the number weighted particle size distribution. Hence if the additive reduces the number of ultra fine particles in the sub-micron region, this will be observed as a reduction in magnitude of the mode of the SMPS generated distribution. Changes in particle size distribution can be related to changes in the number distribution and are likely to result in mass shifts.

Results shown below are presented in 'raw' format i.e. corrected for dilution and the shown as the integral of all the repeats and individual key-points. Fuel A is an EN590 specification fuel with sulphur level 300 ppm. Fuel B is a low sulphur low density diesel with sulphur level of 3ppm. Additive I is a commercially available multifunctional additive package; Additive II is the mfp + ChemEcol additive; Additive III is a tailored ChemEcol additive for ultra low sulphur fuels.

ChemEcol

Effect of ChemEcol Ashless Additive Technology on Emissions of Ultra Fine Particles





Add III = CXIII - 3rd Generation Additive

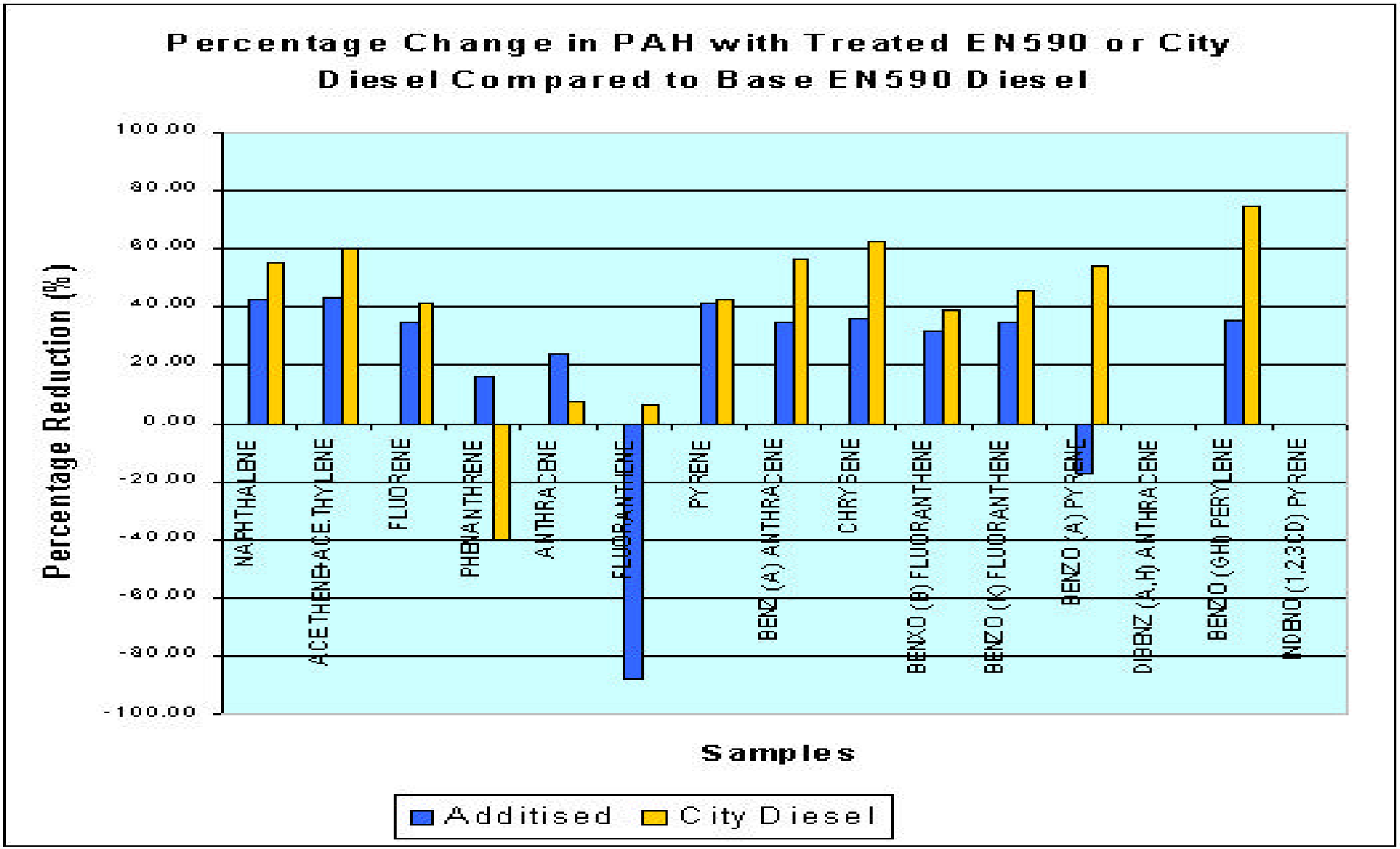
ChemEcol

Effect of ChemEcol Ashless Additive Technology on Emissions of Poly-Aromatic Hydrocarbons

Particulate Extracted PAH from the VWTDi program

Sample µg/KWh	Base EN590	Base EN590	Treated EN590 CXII	Treated EN590 CXII	'City Diesel'	'City Diesel'
NAPHTHALENE	6.05	6.56	3.29	3.99	3.18	2.46
ACE.THENE+ACE.THYLENE	9.13	11.24	5.36	6.18	3.87	4.22
FLUORENE	6.17	5.78	4.15	3.60	3.71	3.31
PHENANTHRENE	2.25	2.67	2.65	1.49	4.02	2.88
ANTHRACENE	2.73	3.34	2.29	2.35	2.96	2.67
FLUORANTHENE	0.59	<0.21	0.72	0.78	0.61	0.14
PYRENE	9.49	11.12	6.15	5.94	6.21	5.63
BENZ (A) ANTHRACENE	2.79	2.73	1.79	1.8	1.25	1.13
CHRYSENE	5.22	5.12	3.22	3.4	2.01	1.86
BENXO (B) FLUORANTHENE	0.53	0.78	0.46	0.43	0.34	0.46
BENZO (K) FLUORANTHENE	0.24	0.22	0.14	0.16	0.11	0.14
BENZO (A) PYRENE	0.18	0.17	0.18	0.23	0.11	0.05
DIBENZ (A,H) ANTHRACENE	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BENZO (GHI) PERYLENE	0.59	0.56	0.43	0.31	0.15	0.14
INDENO (1,2,3CD) PYRENE	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

ChemEcol


Percentage Change in PAH with Treated EN590 or City Diesel Compared to Base EN590 Diesel
Percentage Reduction (%)
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-80.00
-100.00
NAPHTHALENE
ACETHENEACETHYLENE
FLUORENE
PHENANTHRENE
ANTHRACENE
FLUORANTHENE
PYRENE
BENZ(A)ANTHRACENE
CHRYSENE
BENZO(B)FLUORANTHENE
BENZO(K)FLUORANTHENE
BENZO(A)PYRENE
DIBENZ(A,H)ANTHRACENE
BENZO(GHI)PERYLENE
INDENO(1,2,3CD)PYRENE
Samples
Additised
City Diesel

OUR ACHIEVEMENTS TO DATE

Development of 1st non-metallic fully patented diesel combustion enhancer

- Field Testing on additive in excess of 13m km in London Bus fleets
- Statistical confirmation of Fuel Economy Benefits
- Proven Regulated cycle emission reductions of Particulate mass and Gaseous Emissions
- Proven reduction of Ultra fine particle number emissions
- Adoption of additive with a major European National Oil Company
- For further information please visit www. chemecol. net

ChemEcol

Manufacturing Reality

www. chemecol.net